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Request for grant of a patent

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1.	Your reference	DAG/P700451GB 0226980.1
2.	Patent application number *(The Patent Office will fill in this part)*	19 NOV 2002 20NOV02 E764670-11 D00335 F01/7700 0.00-0226980.1
3.	Full name, address and postcode of the or of each applicant (*underline all surnames*)	NEC Technologies (UK) Ltd Level 3 Imperium, Imperial Way Reading, Berkshire, RG2 0TD
	Patents ADP number (*if you know it*)	8362451001
	If the applicant is a corporate body, give the country/state of its incorporation	U.K
4.	Title of the invention	Cellular Network Acquisition Method and Apparatus
5.	Name of your agent (*if you have one*)	**W.P. THOMPSON & CO.**
	"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	Celcon House 289-293 High Holborn London WC1V 7HU
	Patents ADP number *(if you know it)*	158007

6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number	Country	Priority application number *(if you know it)*	Date of filing *(Day/month/year)*
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application		Number of earlier application	Date of filing *(Day/month/year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'yes' if:*
a) any applicant named in part 3is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

Patents Form 1/77

9. Enter then number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	8
Claims(s)	3
Abstract	1
Drawing(s)	1

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(Please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature Date November 19, 2002

W.P. THOMPSON & CO.

12. Name and daytime telephone number of person to contact in the United Kingdom

David Alan Gill
020 7242 3524

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CELLULAR NETWORK ACQUISITION METHOD AND APPARATUS

The present invention relates to a method and apparatus for use in network acquisition for cellular communications devices.

Cellular communications devices such as cell phones, have become increasingly popular and widely adopted and in many instances have become the prime means of communication both for business and domestic requirements.

As such usage becomes more widespread, potentially disadvantageous and limiting features of such devices become more apparent. For example, when a cell phone is first turned on, an acquisition procedure needs to be conducted so that the cell phone can acquire the appropriate communications network and subsequently take part in a communications exchange over that network. The period between turning the cell phone on and actually acquiring the network does not generally go unnoticed by the user and comprises dead time as far as the user is concerned since no other operations over and above network acquisition are conducted during that period. The longer the time period required to acquire the network, the more likely this period is to be noticed by the user and so as to lead to potential irritation.

Also, network acquisition procedures require the cell phone handset to expend a significant amount of power relative to power requirements arising merely for communication procedures.

Indeed, in view of the different mobile communication modes that have arisen, and the subsequent requirement for cell phone handsets to offer dual mode, or indeed multimode, operability, it will become increasingly necessary for each handset to search on more than one mode. Thus potential delays in network acquisition, and related user irritation, could become more frequently experienced. As explained further below network acquisition requires a search

through a set of frequencies – generally defined by a frequency band in an attempt to identify the most suitable cell of a network. With dual mode operation, there will be multiple sets of frequencies to search through in order not only to find the most suitable cell, but also the most suitable network given the at least dual mode operability of the handset.

The present invention seeks to provide for a network acquisition method and apparatus which exhibits advantages over known such methods and apparatus.

According to a first aspect of the present invention, there is provided a method of network acquisition for a cellular communications device comprising determining a most suitable cell based on a characteristic of signals received from a plurality of cells, the signals from each cell being provided over a band of frequencies, and the said determination comprising the steps of taking a series of measurements of the said characteristics for each frequency so as to obtain an average value, wherein each measurement in the said series is taken for all of the frequencies in the said band before the next measurement in the series is taken, and the said series of measurements on each frequency are equally spaced and serve to provide equal intervals therebetween for further processing of signals from network cells or reception and processing of signals from cells on another network.

The present invention is advantageously based upon the realisation that, while network acquisition is generally required within a predetermined time period, the acquisition steps can be arranged so as to lead to the aforesaid equal intervals which can subsequently be used for signal processing such as that related to, for example, additional network acquisition procedures.

Insofar as such additional procedures are carried out within what was previously found to be mere dead time, the amount of dead time is in fact

decreased such that, for example with regard to a dual mode handset. The speed with which acquisition procedures for both radio technology modes can be conducted is advantageously increased.

Advantageously, the said characteristic comprises signal strength, or a derivative thereof, and the number of measurements in the series required so as to arrive at the average value can be in the region of five.

In one embodiment, each of the said equal intervals can be determined to be in the region of 0.5 seconds such that, when employing a series of 5 measurements, there are four such equal intervals leading to a total additional available processing time of two seconds.

Preferably, the method can be employed within a dual mode, or multi-mode device, such that the equal intervals arising during the search on one radio technology (RAT), for example GSM, can be employed for acquisition steps relating to second RAT, for example, UMTS.

Alternatively, and in particular with a single mode device, so-called second stage search operations on cells found to have, for example, high signal strength, can be conducted during the said equal intervals.

According to another aspect of the present invention, there is provided a cellular communications device including means for determining a most suitable cell based upon a characteristic of signals received from a plurality of cells, the signals from each cell being provided over a band of frequencies, the said means for determining comprising means for taking a series of measurements of the said characteristics for each frequency so as to obtain an average value, wherein each measurement in the said series is taken for all the frequencies in the band before the next measurement in the series is taken, and such that the said series of measurements on each frequency are

equally spaced so as to serve to provide equal intervals there between for the further processing signals from the network cells.

Such a device an advantageously be arranged to operate in accordance with the previously defined method steps.

The invention described further hereinafter, by way of example only, with reference to the accompanying drawing, which illustrates acquisitions steps in accordance with a method embodying the present invention.

The following description relates to one example of the present invention for use in relation to a dual mode handset which is required to operate in accordance with two RATs such as, for example, GSM and UMTS.

Some operating specifications, such as the current 3GPP specifications require that a handset search only one RAT at a time. The relative priority of the different RATs is generally set within the handset. Thus, for example, with a dual mode GSM/UMTS handset, a search of the second RAT, for example UMTS, during initial selection is only made if no suitable cells are found when searching in relation to the first RAT, such as GSM.

Such initial searching procedures are relatively simple. For example, using the strength of signals received from the cells, the cells are ranked in order of signal strength and the cell found to be at the top of the list is then accessed for suitability. If suitable, that cell, and the related RAT is effectively acquired by the handset. If not, then a search of the second RAT is conducted.

The 3GPP specification requires that five measurements for each frequency within the frequency band are required to be conducted over a period of no less than 3 seconds in order to produce an average value by

which the cell is ranked in accordance with the process noted above. The measurements are also required to be equally spaced.

While it has previously been thought that such requirements dictate that each of the large plurality of measurements has to be a set equal time period away from the previous measurement. The present invention takes advantage of the realisation that such requirements are not in fact necessary in practice.

In accordance with the present invention, it is realised that it is only the measurements conducted on the same frequency that need to be equally spaced and so the acquisition procedure according to the present invention is conducted merely to ensure that it is only such measurements that need be equally spaced and this serves to free-up the time that was previously taken ensuring that all measurements were equally spaced. This further time that is now available within the acquisition procedure and which no longer represents part of the dead time, is therefore available in accordance with the present invention for subsequent acquisition procedures if required.

Turning now to the accompanying drawing, there is illustrated a series of five measurements A-E taken over time t and in relation to a range of frequencies 1-n forming a frequency band 10 in accordance with a first RAT. In the example illustrated, the acquisition procedures being conducted in relation to the GSM mode and the frequency band 10 actually comprises two GSM bands; the EGSM 900 band which contains 172 frequencies, and the GSM 1800 band containing 374 frequencies. Thus, in the illustrated example, n=546 in that there are 546 different frequencies which are to be measured.

As noted above, and in accordance with the 3GPP specification, the series of five measurements A-E are to be taken over a period of no less than 3 second. Thus, the final measurement E must be taken at a period of at least t=3 seconds or more.

As discussed above, the acquisition procedure is arranged such that it is only the spacings 12, 14, 16, 18 between the series measurements that are equal since, in accordance with the present invention, each of the 546 measurements taken against the frequencies in band 10 and forming the first measurement in the series A do not need to be equally spaced.

Thus, in operation, the first measurement in the series A is taken for all 546 frequencies before the procedure moves to the second measurement B in the series. Since equal spacing between all of the 546 measurements forming the first measurement A in the series is not required, the invention can simply operate to ensure that the 546 measurements are taken as quickly as possible.

It is identified that it takes approximately 350μs to tune to a particular frequency and perform a measurement. Thus, in relation to the entire frequency band 10 for the EGSM 900 and GSM 1800 bands, it will take a total of 0.19 seconds to perform each of the required measurement: that is it will effectively take 0.19 seconds to perform each of the five series of measurements A-E shown in the drawings.

However, and as discussed above, in order to arrive at an average value, five measurements per frequency are taken, i.e. the five measurements A-E illustrated in the drawing, and so this increases the total time required to arrive at the average value on each of the 546 frequencies to 0.95 seconds.

However, insofar as there is a minimum of 3 seconds required to arrive at the final measurements E in the series, and only 0.95 second of this 3 second period is in fact used in the frequency measurement, this leaves just over 2 seconds of the 3 seconds period defined in accordance with the 3GPP specification that can be employed for other purposes.

Returning to the particular requirement of the present invention, i.e. that it is only the spacings 12, 14, 16 and 18 that need to be of equal length, and given that an available period of just over 2 seconds is identified, it arises that each of the spacings 12-18 can be in the order of 0.5 seconds.

Periods of such length can be advantageously employed for further signal processing activity.

As one example and in a dual-mode handset, the four periods of 0.5 seconds can be arranged to search the other of the two RATs. For example, since UMTS has a similar searching averaging requirement to GSM, the UMTS measurements can be placed within the 0.5 second intervals 12-18 arising during the GSM operation and the GSM averaging requirements can still be met. It is then possible to draw up a combined list of GSM and UMTS cells to be considered for cell selection. This can prove particularly advantageous in that a choice can then be made to select either of the two modes and in a manner which requires a time period comparable with that currently known merely to search on one RAT.

As a second example, and one that arises in relation to a single mode phone, the second stage search operations on the cells found have high signals after the initial batch of measurements can be conducted during the 0.5 second periods 12-18. Such operations would normally be performed once the previously mentioned averaging stages have been completed. However, if an initially strong signal is located, there is no particular disadvantage in attempting to read the signal even the signal strength may not yet have been averaged. Again, this can lead to a vastly more efficient use of the acquisition period so as to lead to time saving and reduction in dead time experienced by the user.

It should however be appreciated that the invention is not restricted to the details of the foregoing embodiments. For example the invention can be

employed within multi-mode handsets for any two or more appropriate RATs and the equal spacing between the series of measurements can comprise different values from those noted above particularly when determined in accordance with different operating specifications.

Claims

1. A method of network acquisition for a cellular communications device comprising determining a most suitable cell based on a characteristic of signals received from a plurality of cells, the signals from each cell being provided over a band of frequencies, and the said determination comprising the steps of taking a series of measurements of the said characteristics for each frequency so as to obtain an average value, wherein each measurement in the said series is taken for all of the frequencies in the said band before the next measurement in the series is taken, and the said series of measurements on each frequency are equally spaced and serve to provide equal intervals therebetween for further processing of signals from network cells or reception and processing of signals from cells of another network.

2. A method as claimed in Claim 1, wherein the said characteristic comprises signal strength.

3. A method as claimed in Claim 1 wherein the said characteristic comprises a derivative of the signal strength.

4. A method as claimed in Claim 1, 2 or 3, wherein the said series measurements comprises a series of five measurements.

5. A method as claimed in any one or more of Claims 1-4, wherein the said equal intervals are each in the order of 0.5 second.

6. A method as claimed in any one or more of Claims 1-5, and arranged for at least dual mode operation wherein a search of the RAT according to a second mode is conducted during the said equal intervals.

7. A method as claimed in Claim 6 wherein one RAT comprises GSM and a second RAT comprises UMTS.

8. A method as claimed in any one of Claims 1-5 and for use with a single mode cellular communications device in which second stage search operations are conducted during the said equal intervals.

9. A method as claimed in Claim 8, wherein the said second stage operations are conducted on cells found to have high signal strength after initial measurement.

10. A cellular communications device including means for determining a most suitable cell based upon a characteristic of signals received from a plurality of cells, the signals from each cell being provided over a band of frequencies, the said means for determining comprising means for taking a series of measurements of the said characteristics for each frequency so as to obtain an average value, wherein each measurement in the said series is taken for all the frequencies in the band before the next measurement in the series is taken, and such that the said series of measurements on each frequency

are equally spaced so as to serve to provide equal intervals therebetween for the further processing of signals from the network cells.

11. A device as claimed in Claim 10 and arranged to operate in accordance with the method steps of any one or more of Claims 2-9.

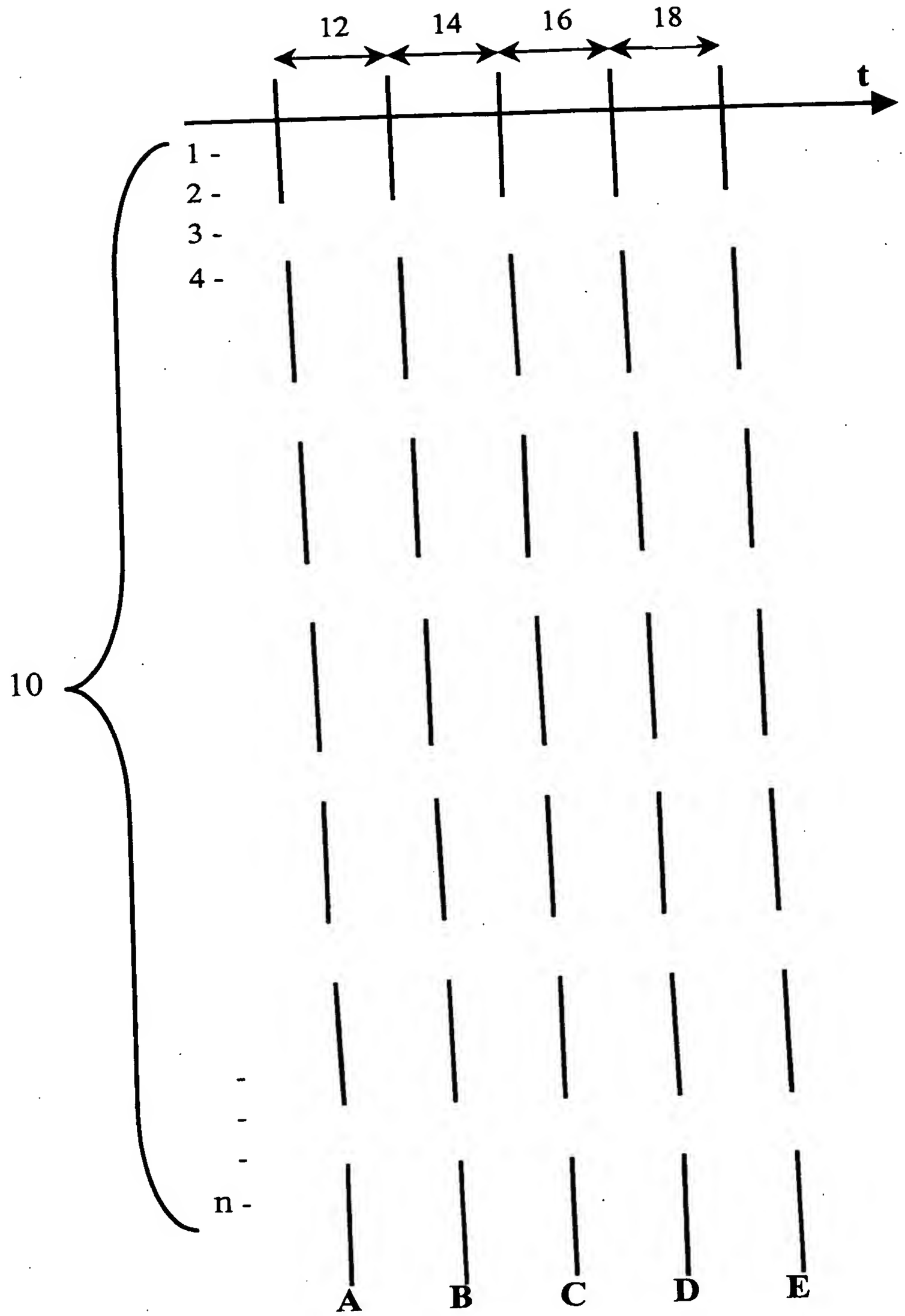
12. A method of network acquisition for a cellular communications device substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawing.

13. A cellular communications device substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawing.

ABSTRACT

CELLULAR NETWORK ACQUISITION METHOD AND APPARATUS

The present invention provides for a cellular communications device comprising determining a most suitable cell based on a characteristic of signals received from a plurality of cells, the signals from each cell being provided over a band of frequencies, and the said determination comprising the steps of taking a series of measurements of the said characteristics for each frequency so as to obtain an average value, wherein each measurement in the said series is taken for all of the frequencies in the said band before the next measurement in the series is taken, and the said series of measurements on each frequency are equally spaced and serve to provide equal intervals therebetween for further processing of signals from network cells.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Priority Document
1 of 1
Inventor: Osamu Yamashita. et al Docket No. WN-2622
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CELLULAR NETWORK ACQUISITION METHOD AND APPARATUS

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